DIALOG(R)File 351:Derwent WPI

011780870 **Image available**
WPI Acc No: 1998-197780/199818
XRPX Acc No: N98-156834

Heating film of fixing device used in electrophotographic image forming apparatus e.g. copier, printer, facsimile - includes nickel metal layer coated with resin layer comprising predefined amount of sulphur which is formed in cylindrical shape

Patent Assignee: CANON KK (CANO)
Number of Countries: 001 Number of Patents: 002
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
JP 10048976	A	19980220	JP 96203654	A	19960801	199818	B
JP 3472043	B2	20031202	JP 96203654	A	19960801	200402	

Priority Applications (No Type Date): JP 96203654 A 19960801
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 10048976	A		9	G03G-015/20	
JP 3472043	B2		9	G03G-015/20	Previous Publ. patent JP 10048976

Abstract (Basic): JP 10048976 A

The film includes a nickel metal layer comprising 0.04wt% of sulphur, which is formed in cylindrical shape, formed on image heating nip with a rotation pressure application member. The cylindrical layer is of variable type.

The cylindrical layer forms a heating nip along with a rotation pressure application member. The cylindrical layer is covered by a resin layer.

ADVANTAGE - Enhances endurance. Offers energy conserving operation.

Dwg.1/10

Title Terms: HEAT; FILM; FIX; DEVICE; ELECTROPHOTOGRAPHIC; IMAGE; FORMING; APPARATUS; COPY; PRINT; FACSIMILE; NICKEL; METAL; LAYER; COATING; RESIN; LAYER; COMPRISE; PREDEFINED; AMOUNT; SULPHUR; FORMING; CYLINDER; SHAPE
Derwent Class: P84; S06; T04; W02; X25
International Patent Class (Main): G03G-015/20
File Segment: EPI; EngPI
?

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－48976

(43)公開日　平成10年(1998)２月20日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ		技術表示箇所
Ｇ０３Ｇ　15/20	１０１		Ｇ０３Ｇ　15/20	１０１	

審査請求　未請求　請求項の数14　ＯＬ　（全９頁）

(21)出願番号　特願平8－203654

(22)出願日　平成８年(1996)８月１日

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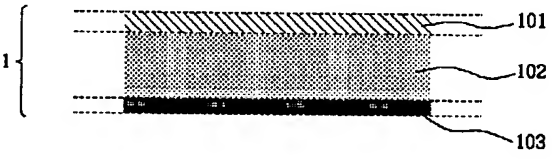
(54)【発明の名称】　像加熱用フィルム、像加熱装置及び画像形成装置

(57)【要約】

【課題】　小熱容量の像加熱フィルムを実現して省電力動作を可能とし、しかも像加熱フィルムと記録材との分離を容易にして、さらに耐久性に富んだ像加熱フィルムを提供すること。

【解決手段】　（１）像加熱フィルムの金属層として、硫黄の含有率が０．０４ｗｔ％以下、又はマンガン含有率が０．２ｗｔ％以上のニッケル金属層を用いること。（２）像加熱フィルムの磁性金属層を導電性樹脂層で被覆すること。



【特許請求の範囲】
【請求項１】　回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、
上記円筒フィルムは硫黄の含有率が０．０４ｗｔ％以下のニッケル金属層と、これを被覆する樹脂層とを有することを特徴とする像加熱用フィルム。
【請求項２】　回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、
上記円筒フィルムはマンガンの含有率が０．２ｗｔ％以上のニッケルからなる金属層と、これを被覆する樹脂層とからなることを特徴とする像加熱用フィルム。
【請求項３】　回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、
上記円筒フィルムは磁性金属層と、これを被覆する単層又は、複数層の樹脂層とを有し、樹脂層のうち少なくとも一層は導電性樹脂層であることを特徴とする像加熱用フィルム。
【請求項４】　磁性金属層は硫黄の含有率が０．０４ｗｔ％以下のニッケル層であることを特徴とする請求項３記載の像加熱用フィルム。
【請求項５】　磁性金属層はマンガンの含有率が０．２ｗｔ％以上のニッケル層であることを特徴とする請求項３記載の像加熱用フィルム。
【請求項６】　樹脂層は導電性樹脂層と、これを被覆する絶縁層とからなることを特徴とする請求項３記載の像加熱用フィルム。
【請求項７】　導電性樹脂層が磁性体を分散含有することを特徴とする請求項３記載の像加熱用フィルム。
【請求項８】　誘導加熱により請求項１記載の像加熱フィルムを発熱させることを特徴とする像加熱装置。
【請求項９】　誘導加熱により請求項２記載の像加熱フィルムを発熱させることを特徴とする像加熱装置。
【請求項１０】　誘導加熱により請求項３記載の像加熱フィルムを発熱させることを特徴とする像加熱装置。
【請求項１１】　記録材上にトナー像を形成し、このトナー像を担持した記録材を定着装置を通過させることにより永久画像ならしめる画像形成装置であって、
上記定着装置として請求項８記載の像加熱装置を用いたことを特徴とする画像形成装置。
【請求項１２】　記録材上にトナー像を形成し、このトナー像を担持した記録材を定着装置を通過させることにより永久画像ならしめる画像形成装置であって、
上記定着装置として請求項９記載の像加熱装置を用いたことを特徴とする画像形成装置。
【請求項１３】　記録材上にトナー像を形成し、このトナー像を担持した記録材を定着装置を通過させることにより永久画像ならしめる画像形成装置であって、
上記定着装置として請求項１１記載の像加熱装置を用いたことを特徴とする画像形成装置。
【請求項１４】　像加熱フィルムが、曲率半径が１２ｍｍ以下の部分が存在するように懸架されている請求項１１、１２又は１３記載の画像形成装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電磁誘導を利用して渦電流を発生させて加熱する像加熱装置に関する。
【０００２】この装置は、特に電子写真複写機・プリンタ・ファックス等の画像形成装置における定着装置、即ち電子写真・静電記録・磁気記録等の適宜の画像形成プロセス手段により、加熱溶融性の樹脂等によりなるトナーを用いて記録材の面に直接若しくは間接方式で形成した未定着のトナー画像を記録材面に永久固着画像として加熱定着処理する装置に関するものである。
【０００３】
【従来の技術】図１０は従来の技術を説明する図であり、電子写真技術をプリンタに応用したレーザービームプリンタの概略断面図である。この装置の動作を以下に説明する。
【０００４】ホストコンピュータより送られた画像情報信号によりスキャナー１３からのレーザー光の強度を変調し、感光ドラム１１上に静電潜像を作成する。レーザー光の強度及び照射スポット径は画像形成装置の解像度及び所望の画像濃度によって適正に設定されており、感光ドラム１１上の静電潜像はレーザー光が照射された部分は明部電位V_Lに、そうでない部分は一次帯電器１２で帯電された暗部電位V_Dに保持されることによって形成する。感光ドラム１１は矢印の方向に回転して静電潜像は現像器１４によって順次現像される。現像器１４内のトナーはトナー供給回転体である現像スリーブ１４０２と現像ブレード１４０１とによって、トナー高さ、トリボを制御され、現像スリーブ上１４０２に均一なトナー層を形成する。現像ブレード１４０１としては通常金属製若しくは樹脂製のものが用いられ、樹脂系のものは現像スリーブ１４０２に対して適正な当接圧をもって接している。現像スリーブ１４０２上に形成されたトナー層は現像スリーブ１４０２自身の回転にともない感光ドラム１１に対向し、現像スリーブ１４０２に印加されている電圧V_{dc}と感光ドラム１１の表面電位が形成する電界によりV_Lの部分だけ選択的に顕像化する。感光ドラム１１上のトナー像は転写装置１５によって、給紙装置から送られてきた紙に順次転写される。転写装置としては図に示したコロナ帯電器以外に、導電弾性回転体に電源から電流を供給して紙に転写電荷を付与しながら搬送する転写ローラ方式がある。トナー像を転写された紙は感光ドラム１１の回転と共に定着装置１０へと送り出され、加熱加圧により永久固定画像となる。
【０００５】加熱定着装置に代表される像加熱装置としては、従来から図１０に示した熱ローラ方式以外に、フィルム加熱方式が広く用いられている。
【０００６】熱ローラ方式はローラ内にハロゲンヒータ

等の熱源を用いるのが一般的であるが、これ以外に熱ローラ自身に電気抵抗を持たせてこれに電力を供給して加熱する自己発熱ローラ方式も考案されている。

【0007】また、フィルム加熱方式としてはセラミックヒータを熱源として小熱容量のフィルムを加熱するものが広く実施されているが、特開平7－114276号公報では金属フィルムを利用して、これを電磁誘導による渦電流で自己発熱させる誘導加熱方式も開示されている。このようなフィルム加熱方式の特徴としては

①小熱容量であるため加熱に要するエネルギーを小さくできて、オンデマンド定着、省エネ定着を実現できる。

②ニップ直後でフィルムの曲率を変化させることができるために、フィルム周長によらず、記録材を曲率分離することが可能である。

③フィルム周長或いは、加圧ローラ径に比較して広いニップを確保することができるため像加熱装置を小さくすることができる。が挙げられる。さらに、金属フィルムを用いた自己発熱型定着装置においては

①金属フィルムの熱伝導性によりニップ内に均一な温度分布を作ることができるため、画像ムラや定着ムラなどの問題が発生しにくい。

②フィルム自身が発熱体であるため、伝達ロスが小さい。

等の特徴を挙げることができる。

【0008】

【発明が解決しようとする課題】しかしながら上記の熱ローラ方式による定着装置では、定着ローラの熱容量が大きく、加熱に要する電力が大きくなるばかりか、ウェイトタイムが長くなるという問題があった。

【0009】また、フルカラーの画像記録装置のような熱容量の大きな定着ローラを用いる場合、温調と定着ローラ表面の昇温とに遅延が発生するため、定着不良や光沢ムラやオフセット等の問題が発生していた。

【0010】さらにフィルム加熱方式、特に金属フィルムを用いた場合には、フィルム自身の回転に伴ってニップ部及びその出入口においてフィルムが屈曲を繰り返されるために機械的に疲労しやすく、耐久性が低いという問題があった。

【0011】また、上記機械的疲労に対して金属層を厚くするのには限界があり、薄い金属層に対しては磁束が有効に働かないためにロスが大きくなるという問題があった。

【0012】本発明は、像加熱装置において小熱容量の加熱体を利用して低エネルギー加熱を可能とし、高耐久性の像加熱用フィルム、像加熱装置及び画像形成装置を提供することを目的としたものである。

【0013】

【課題を解決するための手段】本出願に係る第1の発明は、回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、上記円筒フィルムは硫黄の含有率が0．04wt%以下のニッケル金属層と、これを被覆する樹脂層とを有することを特徴とする像加熱用フィルムである。

【0014】上記構成において、ニッケル中の硫黄成分を抑えることにより屈曲による像加熱フィルムの金属疲労を低減することができる。

【0015】本出願に係る第2の発明は、回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、上記円筒フィルムはマンガンの含有率が0．2wt%以上のニッケルからなる金属層と、これを被覆する樹脂層とを有することを特徴とする像加熱用フィルムである。

【0016】上記構成において、ニッケル中のマンガン成分を加えることにより高温時の像加熱フィルムの柔軟性を高めることができる。

【0017】本出願に係る第3の発明は、回転加圧部材とともに像加熱ニップを形成する曲率可変の円筒フィルムであって、上記円筒フィルムは磁性金属層と、これを被覆する単層又は、複数層の樹脂層とを有し、樹脂層のうち少なくとも一層は導電性樹脂層であることを特徴とする像加熱用フィルムである。

【0018】導電性樹脂層は円筒フィルムに復元力を与えるとともに、磁性金属層の外部の磁束を有効利用できるものである。

【0019】また、本出願に係る第4の発明は、第3の発明において、磁性金属層は硫黄の含有率が0．04wt%以下のニッケル層であることを特徴とする像加熱用フィルムである。

【0020】また、本出願に係る第5の発明は、第3の発明において、磁性金属層はマンガンの含有率が0．2wt%以上のニッケル層であることを特徴とする像加熱用フィルムである。

【0021】また、本出願に係る第6の発明は、第3の発明において、樹脂層は導電性樹脂層と、これを被覆する絶縁層とからなることを特徴とする像加熱用フィルムである。

【0022】上記構成において、絶縁層は導電性樹脂と被加熱像との間に働く電気的鏡映力を減衰させる効果を有する。

【0023】また、本出願に係る第7の発明は、第3の発明において、導電性樹脂層が磁性体を分散含有することを特徴とする像加熱用フィルムである。

【0024】上記構成において磁性体を分散した導電性樹脂層は、磁性金属の外部の磁束を導く効果を有する。

【0025】また、本発明は、上記したこれの像加熱用フィルムに誘導加熱により発熱させることを特徴とする像加熱装置である。

【0026】また、本発明は、記録材上にトナーを形成し、このトナー像を担時した記録材を定着装置を通過させることにより永久画像ならしめる画像形成装置であっ

て、上記定着装置として上記像加熱装置を用いたことを特徴とする画像形成装置である。

【００２７】上記構成において、本発明の像加熱フィルムを用いた像加熱装置は小熱容量の加熱体を利用して低電力動作を可能とし、高い記録材分離性と高耐久性とを有し、上記像加熱装置を備えた画像形成装置は、省エネルギー、高信頼性を有するものとなる。

【００２８】

【発明の実施の形態】図１は本発明の実施例の特徴を表す図面であり、図２はその斜視図である。同図において１は回転加熱部材であるところの定着フィルム、１０５は磁束の通過を妨げない絶縁性のフィルムガイドで、定着フィルム１はフィルムガイド１０５によって搬送安定性を図られながら矢印の方向に回転する。

【００２９】フィルムガイド１０５の形状としてはニップ部で平らな部分をもたせており、ニップ出口近傍において高い曲率（実測曲率半径で５ｍｍ）で定着フィルム１をガイドするような形状となっている。

【００３０】２０１は交番磁束を発生するための励磁コイルであり、フィルムガイド１０５によって支持されている。２０２は励磁コイル２０１で発生する磁束を効率よく定着フィルム１に導くための高透磁率磁性部材であるところのフェライトコアである。３は回転加圧部材であるところの加圧ローラで芯金３０１上にシリコーンゴム層３０２を２ｍｍ被覆させて弾性をもたせ、定着フィルム１とニップＮを形成している。また、加圧ローラ３は定着フィルム１を記録材Ｐの搬送方向に回転駆動させる駆動ローラの役割も兼ねている。

【００３１】励磁コイル２０１には励磁回路６０１が接続されており、この励磁回路６０１は６０ＫＨｚの交番電流を励磁コイル２０１へ供給できるようになっている。５はＮＴＣ素子で定着フィルム１の裏面に接触させてあり、マイコン６０３に定着フィルム１の温度を電圧に変換して伝えている。６０２は矩形波発生回路で、マイコン６０３からの情報によって矩形波のデューティー比を変化させて励磁回路６０１内のスイッチング素子を制御する。

【００３２】励磁コイル２０１としては加熱に十分な交番磁束を発生するものでなければならないが、そのためには抵抗成分を低く、インダクタンス成分を高くとる必要がある。本実施例では励磁コイル２０１の芯線として線径３ｍｍの高周波用のものを用いて、定着フイルム内にニップＮを周回するように１０回巻いてある。

【００３３】励磁コイル２０１は励磁回路６０１から供給される交番電流によって交番磁束を発生し、交番磁束は定着フィルム１の発熱層１０１に渦電流を発生させる。この渦電流は発熱層１０１の固有抵抗によってジュール熱を発生させて、弾性層１０２、離型層１０３を介してニップＮに搬送される記録材Ｐと記録材Ｐ上のトナーＴを加熱することができる。

【００３４】定着フィルム１について図３を用いて詳しく説明する。定着フィルム１は抵抗体であるニッケルからなる厚み５０μｍの円筒状発熱層１０１の表面に樹脂層として、シリコーンゴムからなる弾性層１０２とフッ素樹脂の離型層１０３との２層を設けてある。抵抗体としては10^{-3}～10^{-8}Ω・ｃｍの電気良導体である金属、金属化合物であれば同様の原理で加熱可能であるが、電鋳法によるフィルム製造が容易で、耐腐食性が優れている点からニッケルフィルムが好ましい。通常、電鋳法によるニッケルフィルムは、電解浴中にサッカリン、ベンゼンスルホン酸ナトリウム、ナフタレンスルホン酸ナトリウム等の添加剤を加えることにより、電着応力を低減させて成型精度を向上させ、電鋳被膜に光沢を与えている。一方このようにして製造されたニッケル電鋳は硫黄を含み、柔軟性や高温時の弾力性失われるという性質があるため本発明の構成においては金属疲労が発生して破断するという問題が発生した。そこで、本発明におけるニッケルフィルムにおいては、柔軟性を重視して上記添加剤を極力減量してニッケルフィルムにおける硫黄の含有率を０．０４％（質量比）以下にしたものを用いている。硫黄の含有率が０．０４％を越えると、高温状態においてニッケルフィルムが脆くなったり、柔軟性を失ってしまう。

【００３５】またニッケルフィルムにマンガンを加えることにより高温度にニッケルフィルムが脆くなることを防ぐことができる。ニッケルフィルム中にマンガンを加える方法としては、スルファミン酸ニッケルが３００～４５０ｇ／ｌ、塩化ニッケルが０～３０ｇ／ｌ、およびホウ酸が３０～４５ｇ／ｌからなるニッケル電解液中にマンガン微粒子を入れ良く撹拌した状態で電気メッキする方法が挙げられる。

【００３６】また発熱層１０１の厚みに関しては、薄くすると十分な磁路が確保できなくなり、外部へ磁束が洩れて発熱体自身の発熱エネルギーは小さくなる場合があり、厚くすると熱容量が大きくなり昇温に要する時間が長くなるばかりか、屈曲疲労に対して弱くなる傾向がある。従って厚みは発熱体に用いた材料の比熱、密度、透磁率、抵抗率、不純物含有率の値によって適正値があり、本実施例では５０μｍの厚みで、３℃／ｓｅｃ以上の昇温速度を得ることができて、耐久性も満足するものが得られた。

【００３７】弾性層１０２は２００μｍのシリコーンゴムを用いており、ニップ部において被加熱像を覆って熱の伝達を確実にするとともに、ニッケルフィルムからなる発熱層１０１に復元力を補って、回転・屈曲による疲労を防いでいる。

【００３８】離型層１０３としてはＰＦＡ、ＰＴＦＥ、ＦＥＰ等のフッ素樹脂以外に、シリコーン樹脂、シリコーンゴム、フッ素ゴム、シリコーンゴム等の離型性かつ耐熱性のよい材料を選択することができる。離型層１０

３の厚さは２０～１００μｍが好ましく、離型層１０３の厚さが２０μｍよりも小さいと塗膜の塗ムラで離型性の悪い部分ができたり、耐久性が不足するといった問題が発生する。また、離型層が１００μｍを超えると熱伝導が悪化するという問題が発生し、特に樹脂系の離型層の場合は硬度が高くなりすぎ、弾性層１０２の効果がなくなってしまう。

【００３９】また図４に示すように、定着フィルム１の層構成において断熱層１０４を設けてもよい。断熱層１０４としてはフッ素樹脂、ポリイミド樹脂、ポリアミド樹脂、ポリアミドイミド樹脂、ＰＥＥＫ樹脂、ＰＥＳ樹脂、ＰＰＳ樹脂、ＰＦＡ樹脂、ＰＴＦＥ樹脂、ＦＥＰ樹脂などの耐熱樹脂がよい。また、断熱層１０４の厚さとしては１０～１０００μｍが好ましい。断熱層１０４の厚さが１０μｍよりも小さい場合には断熱効果が得られず、また、耐久性も不足する。一方、１０００μｍを超えると高透磁率コア２０２から発熱層１０１の距離が大きくなり、磁束が十分に発熱層１０１に到達しなくなる。断熱層１０４を設けた場合、発熱層１０１に発生した熱による励磁コイル２０１の昇温を防止できるため、安定した加熱をすることができる。

【００４０】定着フィルム１の径としては内包する励磁コイル２０１やコア２０２の占有容積によって選ぶことができる。本例では円筒形状で直径４０ｍｍのものを用いているが、これを剛体ローラで構成したとすると、図５（１）に示すようにニップ下流端での曲率半径はローラの半径に等しく２０ｍｍとなり、回転加熱体と記録材との曲率分離が困難になって分離爪等の補助部材が必要となる。分離爪は回転加熱体表面を摺擦するために、磨耗跡や汚れなどの問題の原因となりやすく、従来より高画質画像形成装置において重要な問題となる。一方本例では曲率可変なフィルム状回転加熱体を用いることにより、ニップ下流端において曲率を高くして、大径の回転加熱体を用いた場合でも曲率分離を行うことを達成している。

【００４１】なお実測曲率半径は

①定着フィルム１がフィルムガイド１０５に密着しているとみなせる場合には定着フィルムガイド１０５のニップ下流端の丸め半径に定着フィルム１の厚みを加えた値。

②図５（２）に示すようにフィルムガイド１０５に対して定着フィルム１が隙間を有する場合には、ニップ下流端と最大隙間とを定着フィルムが結ぶ曲線から仮想円Ｃを作ったときの外半径ｒ。で定義している。

【００４２】（実施例）

〔実施例１〕図３に示される定着フィルム１を製造した。

【００４３】定着フィルム１は抵抗体であるニッケルからなる厚み５０μｍの円筒状発熱層１０１の表面に樹脂層として、シリコーンゴムからなる弾性層１０２とフッ素樹脂の離型層１０３との２層を設けてある。

【００４４】実験は図６に示すような二つのローラＡ、及びＢに定着ベルト１を懸架して、ローラＢ内にはハロゲンヒータＨを入れて像加熱時と同じ温度条件にし、定着ベルトの発熱層であるニッケルフィルム層に含む硫黄の含有率及び、ローラＢの半径ｒを変化させて空回転耐久及び記録材分離試験を行った。表１に結果を示す。

【００４５】

【表１】

表　1

	曲率半径 (mm) ＼ 硫黄含有率（%）	1	5	10	12	13
耐久時間(h)	0.02	＞1500	＞1500	＞1500	＞1500	＞1500
	0.04	＞1500	＞1500	＞1500	＞1500	＞1500
	0.05	685	723	996	1052	＞1500
	0.1	610	623	645	710	1150
分離不良率		0/1000	0/1000	0/1000	0/1000	23/1000

【００４６】結果より分離部における曲率半径を１２ｍｍ以下にして、ニッケルフィルム中の硫黄含有率を０．０４ｗｔ％以下にすることによって、記録材の分離性を確保し且つ、耐久疲労によるフィルム破断を防止することができることがわかる。なお、上記実験はニッケルフィルム単独について行ったものであるが、別の実験において上記ニッケルフィルムに被覆する樹脂層の有無による違いを確認したところ、本実施例のように樹脂層を設けた場合にはローラＢの半径が１ｍｍの場合でフィルムの耐久寿命が約３０％延びることがわかった。

【００４７】また、ニッケルフィルム中にマンガンを微量加えることにより高温時にニッケルが脆くなることを防ぐことができる。本例の定着フィルムは２００℃程度の温度に耐える必要があり、０．２ｗｔ％以上マンガンを含むニッケルフィルムを用いている。

【００４８】次に最大通紙幅がＡ４サイズ紙、印字速度が毎分３枚の４色カラー画像形成装置の定着装置として上記像加熱装置を用いた場合の作用効果について画像形

成装置の動作と共に記す。

【００４９】図7は本発明を用いた電子写真カラープリンタの断面図である。１１は有機感光体でできた感光体ドラム、１２はこの感光体ドラム１１に一様な帯電を行なうための帯電装置、１３は不図示の画像信号発生装置からの信号をレーザ光のオン／オフに変換し、感光体ドラム１１に静電潜像を形成するレーザ光学箱である。１０１はレーザ光、１１０２はミラーである。感光体ドラム１１の静電潜像は現像器１４によってトナーを選択的に付着させることで顕像化される。現像器１４は、イエローＹ、マゼンタＭ、シアンＣのカラー現像器と黒用の現像器Ｂから構成され、一色ずつ感光体ドラム１１上の潜像を現像しこのトナー像を中間転写体ドラム１６上に順次重ねてカラー画像を得る。中間転写体ドラム１６は金属ドラム上に中抵抗の弾性層と高抵抗の表層を有するもので、金属ドラムにバイアス電位を与えて感光体ドラム１１との電位差でトナー像の転写を行なうものである。一方、給紙カセットから給紙ローラによって送り出された記録材Ｐは、感光体ドラム１１の静電潜像と同期するように転写ローラ１５と中間転写体ドラム１６との間に送り込まれる。転写ローラ１５は記録材Ｐの背面からトナーと逆極性の電荷を供給することで、中間転写体ドラム１６上のトナー像を記録材Ｐ上に転写する。こうして、未定着のトナー像をのせた記録材Ｐは加熱定着装置１０で熱と圧を加えられて、記録材Ｐ上に永久固着させられて、排紙トレー（不図示）へと排出される。感光体ドラム１１上に残ったトナーや紙粉はクリーナ１７によって除去され、また、中間転写体ドラム１６上に残ったトナーや紙粉はクリーナ１８によって除去され、感光体ドラム１１は帯電以降の工程を繰り返す。

【００５０】定着装置１０には上述の像加熱装置を用いており、記録材Ｐはニップで加熱されてトナー像が定着されてニップ出口で分離される。

【００５１】前述のように本例の像加熱装置は、弾性層１０２や離型層１０３の樹脂層を介してはいるが、その熱抵抗はハロゲンヒータを内包する熱ローラ方式の定着装置に比して小さく、発熱体の熱を直接像加熱に消費するものであって、上記構成においてトナー量の多いフルカラー画像を定着する場合にも、トナー像を十分溶融することができて、高画質の画像形成装置を得ることができる。また、定着装置の熱容量が小さいためオンデマンド定着が可能で、待機中の消費電力を著しく低減させることができる。

【００５２】また、本実施例では４色カラー画像形成装置について説明してきたが、モノクロ或いは１パスマルチカラー画像形成装置に利用してもよい。この場合は定着フィルム１の樹脂層として弾性層１０２を省略して離型層１０３だけにすることができる。

【００５３】〔実施例２〕次に、本発明の他の実施例について説明する。

【００５４】本例は像加熱装置より一層の小型化を図ったもので、概略構成は図８に示すものである。なお、図中前出と同機能の部材には同符号を付すものとする。

【００５５】定着フィルム１としては前述同様φ４０ｍｍのものを用いており、フィルムガイド１０５、駆動ローラ１９及び、テンションローラ２０により懸架してある。１９、２０両ローラはともに直径１５ｍｍのものを用いており、駆動ローラ１９では表面に滑り防止加工を施して、定着フィルム１の内面と高摩擦で接触して回転駆動させ、平滑な表面を持つテンションローラ２０は従動回転しながら定着フィルム１に対して一定のテンションをかけてて駆動ローラ１９との良好な接触を確保している。本構成のニップ出口ではテンションローラ２０による引張力により定着フィルム１の曲率を高く（実測曲率半径０．５ｍｍ以下）できる。

【００５６】前述の第一の実施例においては加圧ローラ３により定着フィルム１を駆動するために記録材がニップに挿入された時に駆動力が低下するのに対して、本例では直接定着フィルム１を駆動できるためにスリップなどの問題が発生しにくいという利点がある。

【００５７】一方本構成は３カ所の懸架部で、定着フィルム１の曲率を大きく変化させるのに加えて、定着フィルム１にテンションを加える必要があり、屈曲或いは引っ張りストレスを与えやすい。この点に関して、本発明の定着フィルム１は硫黄分を０．０４％以下に抑えて柔軟性を持たせたことによって、定着フィルム１の金属疲労による破断を防止して高耐久の像加熱装置を実現できる。

【００５８】〔実施例３〕次に本発明のさらなる他の実施例について説明する。本実施例は第一の実施例における弾性層１０２を導電化している。具体的にはシリコーンゴムにカーボンブラックを適量配合して体積抵抗率で10^{6} Ωｃｍ以下に調整した厚み３００μｍのものを用いている。弾性層１０２の導電化に関しては上記方法以外に金属ウィスカー等を配合しても良い。一方、離型層１０３の体積抵抗率は10^{14} Ωｃｍ以上で絶縁層として機能する。

【００５９】本実施例におけるこの導電性弾性層の役割は、磁性金属からなる発熱層１０１の周囲に洩れる磁束のエネルギーを導電弾性層内を流れる電流により消費して周辺への磁束を遮断するとともに、自ら発熱して像加熱に寄与することにある。特に、金属疲労を防止するために発熱層１０２の厚みを薄くしていくと周辺への漏れ磁束が増加するために、導電性弾性層の役割は重要となる。

【００６０】一般に上記導電性弾性層の抵抗値は磁性金属に比較して大きくまた、透磁率も磁性金属に比較すると小さいことから、単独で発熱層として利用した場合には発熱効率が低くなる傾向があるが、本発明の構成によれば磁束エネルギーの大部分を磁性金属で消費して、こ

れを補うものとして上記導電性弾性層を用い場合には高効率の加熱が実現できる。

【００６１】また本例における磁性金属は上記導電性弾性層に対しては磁束の誘導部材として働いて、導電性弾性層に導かれる磁力線の密度を高くして発熱効率を高める作用を持つ。

【００６２】本発明は、上述した磁性金属からなる主発熱層と、導電化した樹脂層とが互いの短所を補足する形で高効率に発熱することに着目したものである。

【００６３】離型層１０３は導電性弾性層１０２に対して記録材を絶縁する絶縁層としても働いて、記録材上の被加熱像と導電性弾性層に働く鏡映力を弱めて、オフセット汚れが発生するのを防ぐ効果がある。

【００６４】図９は、樹脂層として導電性ゴムを用いた場合の効果を確認した実験結果を示すもので、入力電力１０００Ｗ、回転速度１２０ｍｍ／ｓｅｃの条件で、室温からの定着フィルム温度上昇の様子をプロットしたものである。磁性金属との組み合わせは導電性ゴム単独より、また、導電ゴム層を用いた方が絶縁ゴム層より発熱効率が高くなることがわかる。

【００６５】〔実施例４〕次に本発明のさらなる他の実施例について説明する。本実施例は前記第三の実施例の構成においてさらに、弾性層１０２に磁性体を分散させている。磁性体としてはニッケル、コバルト、鉄等の金属、またはこれらの磁性化合物を用いることが好適で、弾性層１０２はカーボンブラックにより導電性を示すとも、磁性体により高い透磁率を有する。これにより導電性弾性層内に高い密度の磁力線が通るために、導電性弾性層を流れる誘導電流密度が高くすることができて、さらなる発熱効率の向上を得ることができる。

【００６６】検討によれば、弾性体１０２に磁性体を配合して透磁率を１０～２００倍にしたもので加熱を行った場合、１０％以上低い電圧において同発熱量（１０００Ｗ）を得ることができた。これは励磁コイル２０１の発生した磁束を効率よく定着フィルム１で消費して熱に変換できていることを意味しており、本発明によれば省エネルギーであるばかりでなく、電源負荷を低減することが可能で、低コストな像加熱装置、或いはこれを用いた画像形成装置を実現できる。

【００６７】

【発明の効果】以上説明したように、本出願の発明によれば、小熱容量の像加熱フィルムを実現して省電力動作を可能とし、しかも像加熱フィルムと記録材との分離を容易にして、さらに耐久性に富んだ像加熱フィルムを実現できる。

【００６８】また、本出願の発明によれば、ウェイトタイムが短縮されて、省エネルギー動作が可能となり、記録材との分離が容易になって信頼性が向上した、高寿命の像加熱装置又は、画像形成装置を実現できる。

【図面の簡単な説明】

【図１】本発明の第１の実施例を説明する概略断面図である。

【図２】本発明の第１の実施例の説明する概略斜視図及び回路接続図である。

【図３】本発明の第１の実施例の定着フィルムの一部断面図である。

【図４】本発明の第１の実施例の動作を説明する図である。

【図５】本発明の定着フィルムの性能試験を説明する概略断面図である。

【図６】本発明の像加熱装置を用いたカラー画像形成装置を説明する概略断面図である。

【図７】本発明の第１の実施例の原理を説明する図である。

【図８】本発明の第２の実施例を説明する概略断面図である。

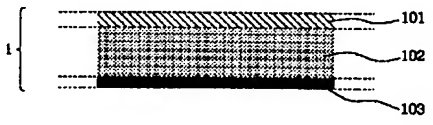
【図９】本発明の第３の実施例の効果を説明する図である。

【図１０】従来例の利用例を示す図である。

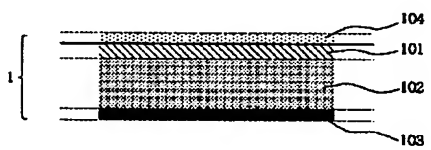
【符号の説明】

１　定着フィルム
１０１　磁性金属層
１０２　弾性樹脂層
１０３　被覆樹脂層
２０１　励磁コイル
２０２　コア
３　加圧ローラ

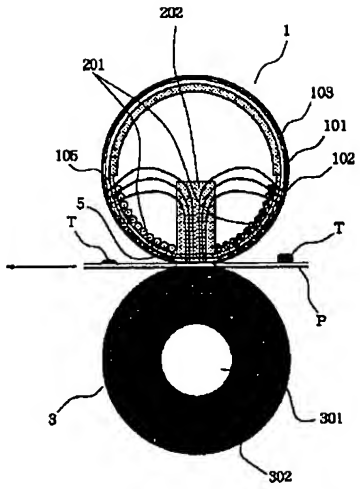
【図３】



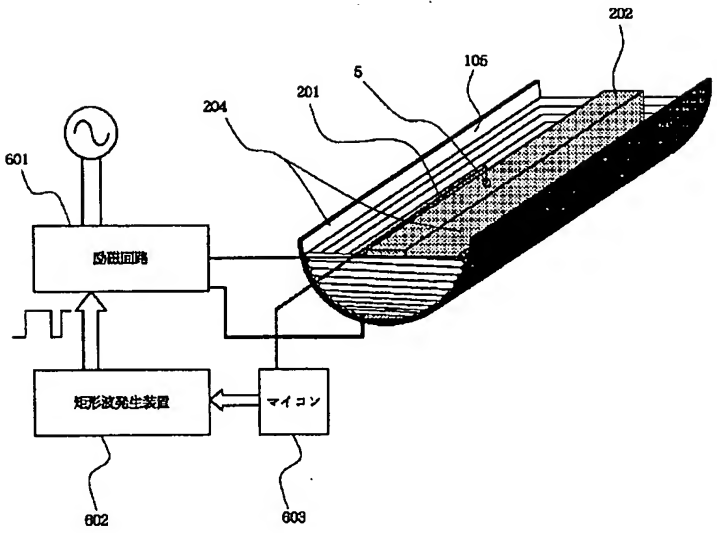
【図４】



【図1】



【図2】



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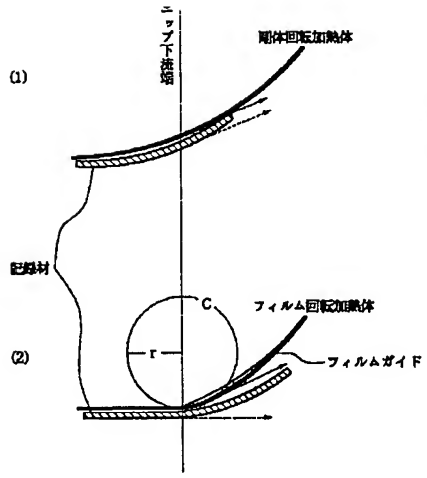
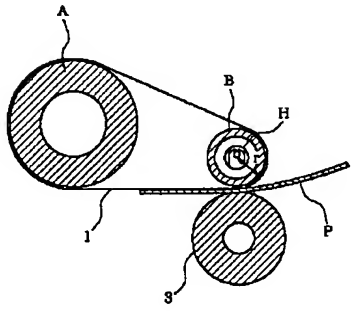
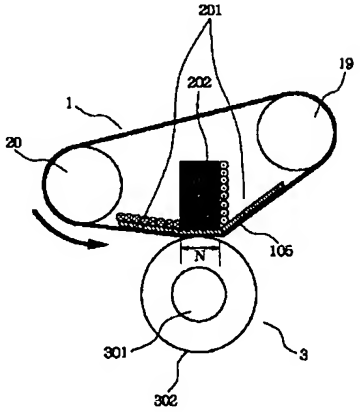


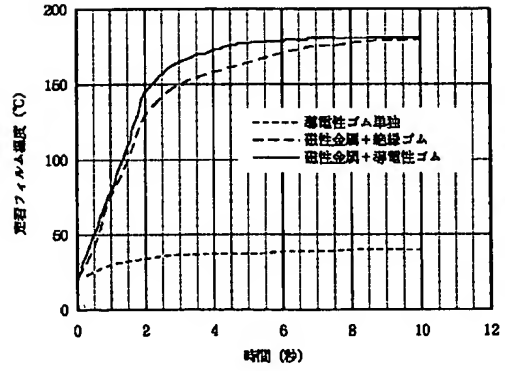
【図6】



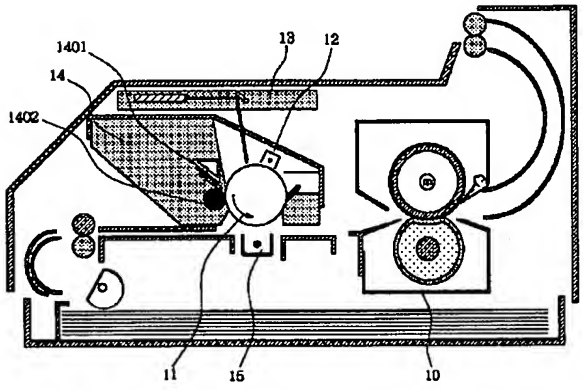
【図8】



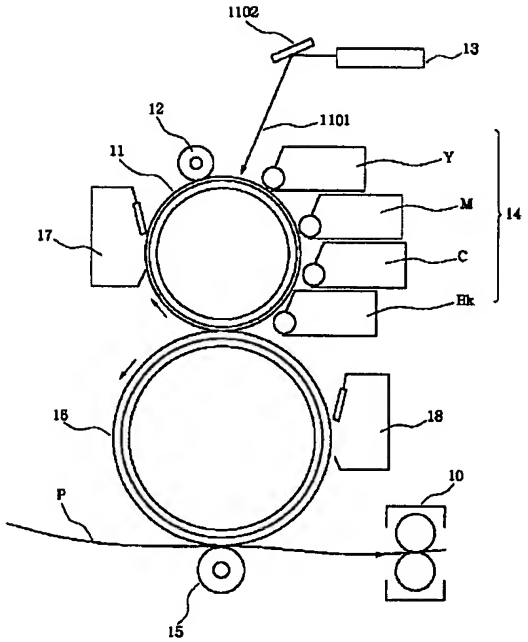
【図9】



【図10】



【図7】



フロントページの続き

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The above-mentioned cylinder film is a film for image heating with which sulphuric content is characterized by being the curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and having a nickel metal layer not more than 0.04wt%, and the resin layer which covers this.
[Claim 2] It is the film for image heating which is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and is characterized by the above-mentioned cylinder film consisting of a metal layer which the content of manganese becomes from the nickel beyond 0.2wt%, and a resin layer which covers this.
[Claim 3] It is the film for image heating which it is the curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and the above-mentioned cylinder film has a magnetic metal layer, and the monolayer which covers this or a two or more layers resin layer, and is characterized by at least one of resin layers being a conductive resin layer.
[Claim 4] A magnetic metal layer is a film for image heating according to claim 3 characterized by sulphuric content being a nickel layer not more than 0.04wt%.
[Claim 5] A magnetic metal layer is a film for image heating according to claim 3 characterized by the content of manganese being a nickel layer beyond 0.2wt%.
[Claim 6] A resin layer is a film for image heating according to claim 3 characterized by consisting of an insulating layer which covers a conductive resin layer and this.
[Claim 7] The film for image heating according to claim 3 characterized by a conductive resin layer carrying out distributed content of the magnetic substance.
[Claim 8] Image heating apparatus characterized by making an image heating film according to claim 1 generate heat by induction heating.
[Claim 9] Image heating apparatus characterized by making an image heating film according to claim 2 generate heat by induction heating.
[Claim 10] Image heating apparatus characterized by making an image heating film according to claim 3 generate heat by induction heating.
[Claim 11] Image formation equipment which is image formation equipment to which the record material which formed the toner image on record material and supported this toner image is closed if it is a permanent image by passing an anchorage device, and is characterized by using image heating apparatus according to claim 8 as the above-mentioned anchorage device.
[Claim 12] Image formation equipment which is image formation equipment to which the record material which formed the toner image on record material and supported this toner image is closed if it is a permanent image by passing an anchorage device, and is characterized by using image heating apparatus according to claim 9 as the above-mentioned anchorage device.
[Claim 13] Image formation equipment which is image formation equipment to which the record material which formed the toner image on record material and supported this toner image is closed if it is a permanent image by passing an anchorage device, and is characterized by using image heating apparatus according to claim 11 as the above-mentioned anchorage device.
[Claim 14] Image formation equipment according to claim 11, 12, or 13 with which the suspension of the image heating film is carried out so that a part 12mm or less may exist [radius of curvature].

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image heating apparatus which is made to generate an eddy current using electromagnetic induction, and is heated.
[0002] Especially this equipment is related with the equipment which carries out heating fixing processing of the toner image which is not established [which was formed in the field of record material by direct or the indirect method using the toner which becomes with the resin of heating melting nature etc.] as a permanent fixing image at a record material surface with proper image-formation process means, such as the anchorage device in image formation equipments, such as an electrophotography copying machine and printer facsimile, i.e., electrophotography, electrostatic recording, magnetic recording, etc.
[0003]
[Description of the Prior Art] Drawing 10 is drawing explaining a Prior art, and is the outline sectional view of the laser beam printer which applied electrophotographic technology to the printer. Actuation of this equipment is explained below.
[0004] The laser luminous intensity from a scanner 13 is modulated with the image information signal sent from the host computer, and an electrostatic latent image is created on a photoconductor drum 11. Laser luminous intensity and the diameter of an exposure spot are set up proper with the resolution of image formation equipment, and desired image concentration, and the part which is not so to the bright section potential VL as for the part by which laser light was irradiated to the electrostatic latent image on a photoconductor drum 11 is formed by being held at the umbra potential VD charged with the primary electrification vessel 12. A photoconductor drum 11 rotates in the direction of an arrow head, and sequential development of the electrostatic latent image is carried out by the development counter 14. The toner in a development counter 14 has toner height and TORIBO controlled by the development sleeve 1402 and the development blade 1401 which are toner supply body of revolution, and forms a uniform toner layer in development sleeve top 1402 with them. As a development blade 1401, the thing made of metal or resin was usually used, and the thing of a resin system has touched with proper contact pressure to the development sleeve 1402. The toner layer formed on the development sleeve 1402 counters a photoconductor drum 11 with rotation of development sleeve 1402 self, and develops only the part of VL alternatively by the electrical potential difference Vdc currently impressed to the development sleeve 1402, and the electric field which the surface potential of a photoconductor drum 11 forms. By imprint equipment 15, the sequential imprint of the toner image on a photoconductor drum 11 is carried out at the paper sent from feed equipment. There is an imprint mechanical control by roller conveyed while supplying a current to electric conduction elastic body of revolution from a power source and giving an imprint charge to paper in addition to the corona-electrical-charging machine shown in drawing as imprint equipment. The paper which had the toner image imprinted is sent out with rotation of a photoconductor drum 11 to an anchorage device 10, and serves as a permanent fixation image by heating pressurization.
[0005] As image heating apparatus represented by the heating anchorage device, the film heating method is widely used in addition to the heat mechanical control by roller shown in drawing 10 from the former.
[0006] Although it is common to use the heat source of a halogen heater etc. into a roller as for a heat mechanical control by roller, the self-exoergic mechanical control by roller which supplies power for the ability giving electric resistance to the heat roller itself, and is heated in addition to this is also devised.
[0007] Moreover, although what heats the film of small heat capacity by making a ceramic heater into a heat

source as a film heating method is carried out widely, in JP,7-114276,A, the induction-heating method which carries out self-generation of heat of this by the eddy current by electromagnetic induction is also indicated using the metal film. Since it is ** smallness heat capacity as a description of such a film heating method, energy which heating takes can be made small, and fixing on demand and energy-saving fixing can be realized.
** Since the curvature of a film can be changed just behind nip, it is possible for it not to be based on the film perimeter but to carry out curvature separation of the record material.
** Since large nip is securable as compared with the film perimeter or the diameter of a pressurization roller, image heating apparatus can be made small. **********. Furthermore, since uniform temperature distribution can be made in nip with the thermal conductivity of ** metal film in the self-exoergic mold anchorage device using a metal film, it is hard to generate problems, such as image nonuniformity and fixing nonuniformity.
** Since the film itself is a heating element, a transfer loss is small.
The description of ** can be mentioned.
[0008]
[Problem(s) to be Solved by the Invention] However, in the anchorage device by the above-mentioned heat mechanical control by roller, there was a problem that the heat capacity of a fixing roller was large and about [that the power which heating takes becomes large], and wait time became long.
[0009] Moreover, since delay occurred in temperature control and the temperature up on the front face of a fixing roller when using a fixing roller with big heat capacity like full color image recording equipment, problems, such as poor fixing, gloss nonuniformity, and offset, had occurred.
[0010] When a film heating method, especially a metal film were furthermore used, in order for a film to have crookedness repeated at the nip section and its entrance with rotation of the film itself, it was easy to get fatigued mechanically, and there was a problem that endurance was low.
[0011] Moreover, there was a limitation in thickening a metal layer to the above-mentioned mechanical fatigue, and in order that magnetic flux might not work effectively to a thin metal layer, there was a problem that a loss became large.
[0012] This invention enables low energy heating in image heating apparatus using the heating object of small heat capacity, and aims at offering the film for image heating, image heating apparatus, and image formation equipment of high endurance.
[0013]
[Means for Solving the Problem] The 1st invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and the above-mentioned cylinder film is a film for image heating with which sulphuric content is characterized by having a nickel metal layer not more than 0.04wt%, and the resin layer which covers this.
[0014] In the above-mentioned configuration, the metal fatigue of the image heating film by crookedness can be reduced by stopping the sulfur component in nickel.
[0015] The 2nd invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and the above-mentioned cylinder film is a film for image heating characterized by having the metal layer which the content of manganese becomes from the nickel beyond 0.2wt%, and the resin layer which covers this.
[0016] In the above-mentioned configuration, the flexibility of the image heating film at the time of an elevated temperature can be raised by adding the manganese component in nickel.
[0017] The 3rd invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, the above-mentioned cylinder film has a magnetic metal layer, and the monolayer which covers this or a two or more layers resin layer, and at least one of resin layers is the film for image heating characterized by being a conductive resin layer.
[0018] A conductive resin layer can use the magnetic flux of the exterior of a magnetic metal layer effectively while giving stability to a cylinder film.
[0019] Moreover, the 4th invention concerning this application is a film for image heating with which, as for a magnetic metal layer, sulphuric content is characterized by being a nickel layer not more than 0.04wt% in the 3rd invention.
[0020] Moreover, the 5th invention concerning this application is a film for image heating with which, as for a magnetic metal layer, content of manganese is characterized by being a nickel layer beyond 0.2wt% in the 3rd

invention.
[0021] Moreover, the 6th invention concerning this application is a film for image heating characterized by a resin layer consisting of an insulating layer which covers a conductive resin layer and this in the 3rd invention.
[0022] In the above-mentioned configuration, an insulating layer has the effectiveness of attenuating the electric reflection force committed between conductive resin and a heated image.
[0023] Moreover, the 7th invention concerning this application is a film for image heating characterized by a conductive resin layer carrying out distributed content of the magnetic substance in the 3rd invention.
[0024] The conductive resin layer which distributed the magnetic substance in the above-mentioned configuration has the effectiveness of drawing the magnetic flux of the exterior of a magnetic metal.
[0025] Moreover, this invention is image heating apparatus characterized by making the above-mentioned film for image heating of this generate heat by induction heating.
[0026] Moreover, this invention is image formation equipment to which the record material which formed the toner on record material and carried out this toner image at the time of ** is closed if it is a permanent image by passing an anchorage device, and is image formation equipment characterized by using the above-mentioned image heating apparatus as the above-mentioned anchorage device.
[0027] In the above-mentioned configuration, the image heating apparatus using the image heating film of this invention enables low power actuation using the heating object of small heat capacity, it has high record material separability and high endurance, and image formation equipment equipped with the above-mentioned image heating apparatus has energy saving and high-reliability.
[0028]
[Embodiment of the Invention] Drawing 1 is a drawing showing the description of the example of this invention, and drawing 2 is the perspective view. In this drawing, the fixing film whose 1 is a rotation heating component, and 105 are the insulating film guides which do not bar passage of magnetic flux, and the fixing film 1 rotates in the direction of an arrow head, while conveyance stability is planned with the film guide 105.
[0029] As a configuration of the film guide 105, the even part is given in the nip section, and it has become the configuration which guides the fixing film 1 [near the nip outlet] with high curvature (it is 5mm at observation radius of curvature).
[0030] 201 is an exiting coil for generating alternate magnetic flux, and is supported with the film guide 105. 202 is a ferrite core which is a high permeability magnetism member for leading efficiently the magnetic flux generated with an exiting coil 201 to the fixing film 1. 3 makes the silicone rubber layer 302 cover with the pressurization roller which is a rotation pressurization member 2mm on rodding 301, gives elasticity, and forms the fixing film 1 and Nip N. Moreover, as for the pressurization roller 3, the role of the driving roller which carries out a rotation drive also serves as the fixing film 1 in the conveyance direction of the record material P.
[0031] The excitation circuit 601 is connected to the exiting coil 201, and this excitation circuit 601 can supply a 60kHz alternation current now to an exiting coil 201. 5 is contacted at the rear face of the fixing film 1 with the NTC component, changed the temperature of the fixing film 1 into the microcomputer 603 at the electrical potential difference, and has told. 602 is a square wave generator, changes the duty ratio of a square wave and controls the switching element in the excitation circuit 601 by information from a microcomputer 603.
[0032] Although alternate magnetic flux sufficient as an exiting coil 201 for heating is generated, for that purpose, it is low in a resistance component, and it necessary to take a high inductance component. As a core wire of an exiting coil 201, using the thing for RFs of 3mm of wire sizes, in this example, it has wound 10 times so that Nip N may be around gone in a fixing film.
[0033] An exiting coil 201 generates alternate magnetic flux according to the alternation current supplied from the excitation circuit 601, and alternate magnetic flux makes the exoergic layer 101 of the fixing film 1 generate an eddy current. This eddy current generates the Joule's heat with the specific resistance of the exoergic layer 101, and can heat the toner T on the record material P conveyed by Nip N through the elastic layer 102 and the mold release layer 103, and the record material P.
[0034] The fixing film 1 is explained in detail using drawing 3 . The fixing film 1 has prepared two-layer [of the elastic layer 102 and the mold release layer 103 of a fluororesin which consist of silicone rubber] as a resin layer in the front face of the cylindrical exoergic layer 101 with a thickness of 50 micrometers it is thin from the nickel which is a resistor. Although it can heat by the same principle if it is the metal and metallic compounds which are the electric good conductors of 10-3 - 10-8 ohm-cm as a resistor, the film manufacture by electroforming is easy and the point that corrosion resistance is excellent to a nickel film is desirable. Usually,

by adding additives, such as saccharin, benzenesulfonic acid sodium, and naphthalene sulfonic-acid sodium, into an electrolytic bath, the nickel film by electroforming reduced stress in electrodeposits, raised molding precision, and has given gloss to the electrocasting coat. Including sulfur, since nickel electrocasting manufactured by doing in this way on the other hand had a property of resiliency ******** at the time of flexibility or an elevated temperature, the problem that the metal fatigue occurred and fractured in the configuration of this invention generated it. Then, in the nickel film in this invention, what thought flexibility as important, decreased the quantity of the above-mentioned additive as much as possible, and made content of the sulfur in a nickel film below 0.04% (mass ratio) is used. If sulphuric content exceeds 0.04%, in an elevated-temperature condition, a nickel film will become weak or flexibility will be lost.

[0035] Moreover, it can prevent a nickel film becoming weak at high temperature by adding manganese to a nickel film. The approach of carrying out electroplating, where it was easy to put in a manganese particle and it is agitated as an approach of adding manganese into a nickel film, in the nickel electrolytic solution with which 300 - 450 g/l consists [nickel amiosulfonate], and 0 - 30 g/l and a boric acid consist [a nickel chloride] of 30 - 45 g/l is mentioned.

[0036] Moreover, when it is made thin, it becomes impossible to secure sufficient magnetic path about the thickness of the exoergic layer 101, and magnetic flux leaks to the exterior, and when it thickens, it has [own exoergic energy of a heating element may become small, and] the inclination for heat capacity to become large and for the time amount which a temperature up takes to become weak to about [becoming long] and crookedness fatigue. Therefore, with the value of the specific heat of the ingredient which used thickness for the heating element, a consistency, permeability, resistivity, and impurity content, there is a proper value and that with which it is 50 micrometers in thickness in this example, and the programming rate 3 degrees C / more than sec can be obtained, and endurance is also satisfied of a programming rate was obtained.

[0037] The elastic layer 102 uses 200-micrometer silicone rubber, compensated with stability the exoergic layer 101 which consists of a nickel film, and has prevented fatigue by rotation and crookedness while it covers a heated image in the nip section and ensures transfer of heat.

[0038] As a mold release layer 103, the good ingredient of the mold-release characteristic of silicone resin, silicone rubber, a fluororubber, silicone rubber, etc. and thermal resistance can be chosen in addition to fluororesins, such as PFA, PTFE, and FEP. The problem that the bad part of a mold-release characteristic will be made in the ** nonuniformity of a paint film if the thickness of the mold release layer 103 has desirable 20-100 micrometers and the thickness of the mold release layer 103 is smaller than 20 micrometers, or endurance runs short occurs. Moreover, if a mold release layer exceeds 100 micrometers, the problem that heat conduction gets worse will occur, especially when it is the mold release layer of a resin system, a degree of hardness will become high too much, and the effectiveness of the elastic layer 102 will be lost.

[0039] Moreover, as shown in drawing 4 , a thermal break 104 may be formed in the lamination of the fixing film 1. As a thermal break 104, heat-resistant resin, such as a fluororesin, polyimide resin, polyamide resin, polyamidoimide resin, PEEK resin, PES resin, PPS resin, PFA resin, PTFE resin, and an FEP resin, is good. Moreover, as thickness of a thermal break 104, 10-1000 micrometers is desirable. When the thickness of a thermal break 104 is smaller than 10 micrometers, adiabatic efficiency is not acquired, and endurance also runs short. When it exceeds 1000 micrometers, the distance of the high permeability core 202 to the exoergic layer 101 becomes large, and magnetic flux stops on the other hand, fully reaching the exoergic layer 101. Since the temperature up of the exiting coil 201 by the heat generated in the exoergic layer 101 can be prevented when a thermal break 104 is formed, stable heating can be carried out.

[0040] It can choose with the occupancy volume of the exiting coil 201 and core 202 which are connoted as a path of the fixing film 1. Although the thing with a diameter of 40mm is used by the shape of a cylindrical shape by this example, supposing it constitutes this from a rigid-body roller, as shown in drawing 5 R> 5 (1), the radius of curvature in a nip down-stream edge is set to 20mm equally to the radius of a roller, curvature separation with a rotation heating object and record material becomes difficult, and auxiliary members, such as a separation pawl, are needed. In order to carry out rubbing of the rotation heating body surface, a separation pawl tends to cause the problem of the remains of wear, dirt, etc., and poses an important problem in high-definition image formation equipment conventionally. On the other hand, by this example, by using a strange film-like rotation heating object with good curvature, even when curvature is made high in a nip down-stream edge and the rotation heating object of a major diameter is used, it has attained performing curvature separation.

[0041] In addition, observation radius of curvature is the value which applied the thickness of the fixing film 1 to the rounding-off radius of the nip down-stream edge of the fixing film guide 105 when it was able to be considered that ** fixing film 1 has stuck to the film guide 105.
** The circumradius r when making the virtual circle C from the curve to which a fixing film connects a nip down-stream edge and the maximum clearance, when the fixing film 1 has a clearance to the film guide 105, as shown in drawing 5 (2). The definition is come out and given.
[0042] (Example)
[Example 1] The fixing film 1 shown in drawing 3 was manufactured.
[0043] The fixing film 1 has prepared two-layer [of the elastic layer 102 and the mold release layer 103 of a fluororesin which consist of silicone rubber] as a resin layer in the front face of the cylindrical exoergic layer 101 with a thickness of 50 micrometers it is thin from the nickel which is a resistor.
[0044] The experiment carried out the suspension of the fixing belt 1 to two rollers A and B as shown in drawing 6 , put in the halogen heater H in Roller B, and was made into the same temperature conditions as the time of image heating, the content of the sulfur included in the nickel film layer which is an exoergic layer of a fixing belt, and the radius r of Roller B were changed, and empty rotation durability and a record material separation trial were performed. A result is shown in Table 1.
[0045]
[Table 1]

表 1

	曲率半径 (mm) / 硫黄含有率 (%)	1	5	10	12	13
耐久時間 (h)	0.02	> 1500	> 1500	> 1500	> 1500	> 1500
	0.04	> 1500	> 1500	> 1500	> 1500	> 1500
	0.05	685	723	996	1052	> 1500
	0.1	610	623	645	710	1150
分離不良率		0/1000	0/1000	0/1000	0/1000	23/1000

[0046] By setting the radius of curvature in the separation section to 12mm or less, and making sulfur content in a nickel film into less than [0.04wt%] from a result, shows that the separability of record material can be secured and the film fracture by durable fatigue can be prevented. In addition, although the above-mentioned experiment followed a nickel film independent, when the difference arising from the existence of the resin layer covered on the above-mentioned nickel film in another experiment was checked, and a resin layer was prepared like this example, it turned out that the endurance life of a film is prolonged about 30% in the case where the radius of Roller B is 1mm.
[0047] moreover, the inside of a nickel film -- manganese -- minute amount ****** -- it can prevent nickel becoming weak by things at the time of an elevated temperature. The fixing film of this example needs to bear the temperature of about 200 degrees C, and the nickel film containing more than 0.2wt% manganese is used.
[0048] Next, it describes with actuation of image formation equipment about the operation effectiveness at the time of using the above-mentioned image heating apparatus as an anchorage device of 4 color color picture formation equipment whose maximum main street paper width is A4 size paper and whose printing speed is per minute three sheets.
[0049] Drawing 7 is the sectional view of the electrophotography color printer which used this invention. Electrification equipment for the photo conductor drum which was able to do 11 with the organic photo conductor, and 12 to perform uniform electrification to this photo conductor drum 11, and 13 are ON of a laser beam / laser optical box which changes off and forms an electrostatic latent image in the photo conductor drum 11 about the signal from a non-illustrated picture signal generator. 1101 is a laser beam and 1102 is a mirror. A development counter 14 develops the electrostatic latent image of the photo conductor drum 11 by making a toner adhere alternatively. A development counter 14 consists of Yellow Y, Magenta M, a color development counter of Cyanogen C, and a development counter B for black, develops the latent image on the Isshiki [every] photo conductor drum 11, and obtains a color picture for this toner image in piles one by one on the

middle imprint object drum 16. The middle imprint object drum 16 has the elastic layer of the inside resistance to metal drum lifting, and the surface of high resistance, gives bias potential to a metal drum, and imprints a toner image by the potential difference with the photo conductor drum 11. On the other hand, the record material P sent out with the feed roller from the sheet paper cassette is sent in between the imprint roller 15 and the middle imprint object drum 16 so that it may synchronize with the electrostatic latent image of the photo conductor drum 11. The imprint roller 15 is supplying a toner and the charge of reversed polarity from the tooth back of the record material P, and imprints the toner image on the middle imprint object drum 16 on the record material P. In this way, the record material P which carried the non-established toner image can apply heat and ** with the heating anchorage device 10, is made they to carry out permanent fixing on the record material P, and is discharged to a paper output tray (un-illustrating). The toner and paper powder which the toner and paper powder which remained on the photo conductor drum 11 were removed by the cleaner 17, and remained on the middle imprint object drum 16 are removed by the cleaner 18, and the photo conductor drum 11 repeats the process after electrification.

[0050] Above-mentioned image heating apparatus is used for the anchorage device 10, it is heated by nip, is fixed to a toner image, and the record material P is separated at a nip outlet.

[0051] As mentioned above, also when the thermal resistance is small, consumes the heat of a heating element to true image heating and is established in a full color image with many amounts of toners in the above-mentioned configuration as compared with the anchorage device of a heat mechanical control by roller which connotes a halogen heater through the resin layer of the elastic layer 102 or the mold release layer 103, the image heating apparatus of this example can fuse a toner image enough, and can obtain high-definition image formation equipment. Moreover, since the heat capacity of an anchorage device is small, fixing on demand can be possible, and waiting power consumption can be reduced remarkably.

[0052] Moreover, although this example has explained 4 color color picture formation equipment, you may use for monochrome or one-pass multicolor image formation equipment. In this case, the elastic layer 102 can be omitted as a resin layer of the fixing film 1, and it can be made only the mold release layer 103.

[0053] [Example 2] Next, other examples of this invention are explained.

[0054] This example is what attained miniaturization much more than image heating apparatus, and an outline configuration is shown in drawing 8 . In addition, a same sign shall be given to the member of drawing Nakamae appearance and this function.

[0055] The phi40mm thing is used like the above-mentioned as a fixing film 1, and suspension has been carried out with the film guide 105, the driving roller 19, and the tension roller 20. Both 19 or 20-car rollers use the thing with a diameter of 15mm, and with the driving roller 19, nonskid processing was performed to the front face, the rotation drive was contacted and carried out by the inside of the fixing film 1, and high friction, and carrying out follower rotation, the tension roller 20 with a smooth front face has applied the fixed tension to the fixing film 1, and has secured the good contact to a driving roller 19. At the nip outlet of this configuration, the curvature of the fixing film 1 can be made high (observation radius of curvature of 0.5mm or less) with the tensile force by the tension roller 20.

[0056] Since the fixing film 1 is driven with the pressurization roller 3 in the first above-mentioned example, when record material is inserted in nip, since the direct fixing film 1 can be driven, by this example, there is an advantage of being hard to generate the problem of a slip etc., to driving force declining.

[0057] On the other hand, these configurations are the three suspension sections, in addition to changing the curvature of the fixing film 1 a lot, need to add a tension to the fixing film 1, and tend to give crookedness or hauling stress. About this point, by having stopped the sulfur content to 0.04% or less, and having given flexibility, the fixing film 1 of this invention prevents fracture by the metal fatigue of the fixing film 1, and can realize the image heating apparatus of high durability.

[0058] [an example 3] -- a degree -- this invention -- being the further -- others -- an example is explained. This example has electric-conduction-ized the elastic layer 102 in the first example. The thing with a thickness of 300 micrometers which carried out optimum dose combination of the carbon black, and was specifically adjusted to silicone rubber by the volume resistivity below at 106-ohmcm is used. About electric-conduction-izing of the elastic layer 102, a metal whisker etc. may be blended in addition to the above-mentioned approach. On the other hand, the volume resistivity of the mold release layer 103 functions as an insulating layer above 1014-ohmcm.

[0059] The role of this conductive elastic layer in this example is to generate heat oneself and contribute to

image heating while it consumes the energy of the magnetic flux which leaks to the perimeter of the exoergic layer 101 which consists of a magnetic metal according to the current which flows the inside of an electric conduction elastic layer and intercepts the magnetic flux to the circumference. Since the leakage flux to the circumference will increase if thickness of the exoergic layer 102 is made thin in order to prevent the metal fatigue especially, the role of a conductive elastic layer becomes important.

[0060] Although the resistance of the above-mentioned conductive elastic layer generally has the inclination for exoergic effectiveness to become low when it uses as an exoergic layer independently since permeability is also greatly small again as compared with a magnetic metal as compared with a magnetic metal, according to the configuration of this invention, the great portion of magnetic-flux energy is consumed with a magnetic metal, and efficient heating can be realized to a case, using the above-mentioned conductive elastic layer as that with which this is compensated.

[0061] Moreover, the magnetic metal in this example works as an induction member of magnetic flux to the above-mentioned conductive elastic layer, and has the operation which makes high the consistency of the line of magnetic force led to a conductive elastic layer, and raises exoergic effectiveness.

[0062] Its attention is paid to this invention generating heat efficient in the form supplementary to the demerit in which the main exoergic layer which consists of a magnetic metal mentioned above and the electric-conduction-ized resin layer are mutual.

[0063] The mold release layer 103 weakens the reflection force which commits also as an insulating layer which insulates record material to the conductive elastic layer 102, and is committed in the heated image and the conductive elastic layer on record material, and has the effectiveness which prevents generating offset dirt.

[0064] Drawing 9 shows the experimental result which checked the effectiveness at the time of using conductive rubber as a resin layer, is the conditions of input power 1000W and rotational-speed 120 mm/sec, and plots the situation of the fixing film temperature rise from a room temperature. As for the combination with a magnetic metal, it turns out that exoergic effectiveness becomes [the direction which used the electrical-conductive-gum layer] high from an insulating rubber layer more nearly again than a conductive rubber independent.

[0065] [an example 4] -- a degree -- this invention -- being the further -- others -- an example is explained. This example is making the elastic layer 102 distribute the magnetic substance further in the configuration of said third example. It is suitable to use metals, such as nickel, cobalt, and iron, or these magnetic compounds as the magnetic substance, and the elastic layer 102 has high permeability with the magnetic substance as if carbon black shows conductivity. Since the line of magnetic force of a high consistency passes in a conductive elastic layer by this, the flowing induced current consistency can make a conductive elastic layer high, and improvement in the further exoergic effectiveness can be obtained.

[0066] When it heated by being that which blended the magnetic substance with the elastic body 102, and increased permeability 10 to 200 times according to examination, this calorific value (1000W) was able to be obtained in the electrical potential difference low 10% or more. It means that this consumed efficiently the magnetic flux which the exiting coil 201 generated with the fixing film 1, and has changed it into heat, and it is not only energy saving, but according to this invention, it is possible to reduce a power-source load and it can realize low cost image heating apparatus or the image formation equipment using this.

[0067]

[Effect of the Invention] According to invention of this application, as explained above, the image heating film of small heat capacity is realized, power-saving actuation is enabled, moreover separation with an image heating film and record material is made easy, and the image heating film which was further rich in endurance can be realized.

[0068] Moreover, according to invention of this application, wait time is shortened, energy-saving actuation is attained, separation with record material becomes easy, and the image heating apparatus of a high life whose dependability improved, or image formation equipment can be realized.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the image heating apparatus which is made to generate an eddy current using electromagnetic induction, and is heated.
[0002] Especially this equipment is related with the equipment which carries out heating fixing processing of the toner image which is not established [which was formed in the field of record material by direct or the indirect method using the toner which becomes with the resin of heating melting nature etc.] as a permanent fixing image at a record material surface with proper image-formation process means, such as the anchorage device in image formation equipments, such as an electrophotography copying machine and printer facsimile, i.e., electrophotography, electrostatic recording, magnetic recording, etc.

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PRIOR ART

[Description of the Prior Art] Drawing 10 is drawing explaining a Prior art, and is the outline sectional view of the laser beam printer which applied electrophotographic technology to the printer. Actuation of this equipment is explained below.

[0004] The laser luminous intensity from a scanner 13 is modulated with the image information signal sent from the host computer, and an electrostatic latent image is created on a photoconductor drum 11. Laser luminous intensity and the diameter of an exposure spot are set up proper with the resolution of image formation equipment, and desired image concentration, and the part which is not so to the bright section potential VL as for the part by which laser light was irradiated to the electrostatic latent image on a photoconductor drum 11 is formed by being held at the umbra potential VD charged with the primary electrification vessel 12. A photoconductor drum 11 rotates in the direction of an arrow head, and sequential development of the electrostatic latent image is carried out by the development counter 14. The toner in a development counter 14 has toner height and TORIBO controlled by the development sleeve 1402 and the development blade 1401 which are toner supply body of revolution, and forms a uniform toner layer in development sleeve top 1402 with them. As a development blade 1401, the thing made of metal or resin was usually used, and the thing of a resin system has touched with proper contact pressure to the development sleeve 1402. The toner layer formed on the development sleeve 1402 counters a photoconductor drum 11 with rotation of development sleeve 1402 self, and develops only the part of VL alternatively by the electrical potential difference Vdc currently impressed to the development sleeve 1402, and the electric field which the surface potential of a photoconductor drum 11 forms. By imprint equipment 15, the sequential imprint of the toner image on a photoconductor drum 11 is carried out at the paper sent from feed equipment. There is an imprint mechanical control by roller conveyed while supplying a current to electric conduction elastic body of revolution from a power source and giving an imprint charge to paper in addition to the corona-electrical-charging machine shown in drawing as imprint equipment. The paper which had the toner image imprinted is sent out with rotation of a photoconductor drum 11 to an anchorage device 10, and serves as a permanent fixation image by heating pressurization.

[0005] As image heating apparatus represented by the heating anchorage device, the film heating method is widely used in addition to the heat mechanical control by roller shown in drawing 10 from the former.

[0006] Although it is common to use the heat source of a halogen heater etc. into a roller as for a heat mechanical control by roller, the self-exoergic mechanical control by roller which supplies power for the ability giving electric resistance to the heat roller itself, and is heated in addition to this is also devised.

[0007] Moreover, although what heats the film of small heat capacity by making a ceramic heater into a heat source as a film heating method is carried out widely, in JP,7-114276,A, the induction-heating method which carries out self-generation of heat of this by the eddy current by electromagnetic induction is also indicated using the metal film. Since it is ** smallness heat capacity as a description of such a film heating method, energy which heating takes can be made small, and fixing on demand and energy-saving fixing can be realized. ** Since the curvature of a film can be changed just behind nip, it is possible for it not to be based on the film perimeter but to carry out curvature separation of the record material.

** Since large nip is securable as compared with the film perimeter or the diameter of a pressurization roller, image heating apparatus can be made small. **********. Furthermore, since uniform temperature distribution can be made in nip with the thermal conductivity of ** metal film in the self-exoergic mold anchorage device using a metal film, it is hard to generate problems, such as image nonuniformity and fixing nonuniformity.

** Since the film itself is a heating element, a transfer loss is small.
The description of ** can be mentioned.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to invention of this application, as explained above, the image heating film of small heat capacity is realized, power-saving actuation is enabled, moreover separation with an image heating film and record material is made easy, and the image heating film which was further rich in endurance can be realized.

[0068] Moreover, according to invention of this application, wait time is shortened, energy-saving actuation is attained, separation with record material becomes easy, and the image heating apparatus of a high life whose dependability improved, or image formation equipment can be realized.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the anchorage device by the above-mentioned heat mechanical control by roller, there was a problem that the heat capacity of a fixing roller was large and about [that the power which heating takes becomes large], and wait time became long.
[0009] Moreover, since delay occurred in temperature control and the temperature up on the front face of a fixing roller when using a fixing roller with big heat capacity like full color image recording equipment, problems, such as poor fixing, gloss nonuniformity, and offset, had occurred.
[0010] When a film heating method, especially a metal film were furthermore used, in order for a film to have crookedness repeated at the nip section and its entrance with rotation of the film itself, it was easy to get fatigued mechanically, and there was a problem that endurance was low.
[0011] Moreover, there was a limitation in thickening a metal layer to the above-mentioned mechanical fatigue, and in order that magnetic flux might not work effectively to a thin metal layer, there was a problem that a loss became large.
[0012] This invention enables low energy heating in image heating apparatus using the heating object of small heat capacity, and aims at offering the film for image heating, image heating apparatus, and image formation equipment of high endurance.

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MEANS

[Means for Solving the Problem] The 1st invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and the above-mentioned cylinder film is a film for image heating with which sulphuric content is characterized by having a nickel metal layer not more than 0.04wt%, and the resin layer which covers this.
[0014] In the above-mentioned configuration, the metal fatigue of the image heating film by crookedness can be reduced by stopping the sulfur component in nickel.
[0015] The 2nd invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, and the above-mentioned cylinder film is a film for image heating characterized by having the metal layer which the content of manganese becomes from the nickel beyond 0.2wt%, and the resin layer which covers this.
[0016] In the above-mentioned configuration, the flexibility of the image heating film at the time of an elevated temperature can be raised by adding the manganese component in nickel.
[0017] The 3rd invention concerning this application is a curvature adjustable cylinder film which forms image heating nip with a rotation pressurization member, the above-mentioned cylinder film has a magnetic metal layer, and the monolayer which covers this or a two or more layers resin layer, and at least one of resin layers is the film for image heating characterized by being a conductive resin layer.
[0018] A conductive resin layer can use the magnetic flux of the exterior of a magnetic metal layer effectively while giving stability to a cylinder film.
[0019] Moreover, the 4th invention concerning this application is a film for image heating with which, as for a magnetic metal layer, sulphuric content is characterized by being a nickel layer not more than 0.04wt% in the 3rd invention.
[0020] Moreover, the 5th invention concerning this application is a film for image heating with which, as for a magnetic metal layer, content of manganese is characterized by being a nickel layer beyond 0.2wt% in the 3rd invention.
[0021] Moreover, the 6th invention concerning this application is a film for image heating characterized by a resin layer consisting of an insulating layer which covers a conductive resin layer and this in the 3rd invention.
[0022] In the above-mentioned configuration, an insulating layer has the effectiveness of attenuating the electric reflection force committed between conductive resin and a heated image.
[0023] Moreover, the 7th invention concerning this application is a film for image heating characterized by a conductive resin layer carrying out distributed content of the magnetic substance in the 3rd invention.
[0024] The conductive resin layer which distributed the magnetic substance in the above-mentioned configuration has the effectiveness of drawing the magnetic flux of the exterior of a magnetic metal.
[0025] Moreover, this invention is image heating apparatus characterized by making the above-mentioned film for image heating of this generate heat by induction heating.
[0026] Moreover, this invention is image formation equipment to which the record material which formed the toner on record material and carried out this toner image at the time of ** is closed if it is a permanent image by passing an anchorage device, and is image formation equipment characterized by using the above-mentioned image heating apparatus as the above-mentioned anchorage device.
[0027] In the above-mentioned configuration, the image heating apparatus using the image heating film of this invention enables low power actuation using the heating object of small heat capacity, it has high record material separability and high endurance, and image formation equipment equipped with the above-mentioned image heating apparatus has energy saving and high-reliability.

[0028]
[Embodiment of the Invention] Drawing 1 is a drawing showing the description of the example of this invention, and drawing 2 is the perspective view. In this drawing, the fixing film whose 1 is a rotation heating component, and 105 are the insulating film guides which do not bar passage of magnetic flux, and the fixing film 1 rotates in the direction of an arrow head, while conveyance stability is planned with the film guide 105.
[0029] As a configuration of the film guide 105, the even part is given in the nip section, and it has become the configuration which guides the fixing film 1 [near the nip outlet] with high curvature (it is 5mm at observation radius of curvature).
[0030] 201 is an exiting coil for generating alternate magnetic flux, and is supported with the film guide 105. 202 is a ferrite core which is a high permeability magnetism member for leading efficiently the magnetic flux generated with an exiting coil 201 to the fixing film 1. 3 makes the silicone rubber layer 302 cover with the pressurization roller which is a rotation pressurization member 2mm on rodding 301, gives elasticity, and forms the fixing film 1 and Nip N. Moreover, as for the pressurization roller 3, the role of the driving roller which carries out a rotation drive also serves as the fixing film 1 in the conveyance direction of the record material P.
[0031] The excitation circuit 601 is connected to the exiting coil 201, and this excitation circuit 601 can supply a 60kHz alternation current now to an exiting coil 201. 5 is contacted at the rear face of the fixing film 1 with the NTC component, changed the temperature of the fixing film 1 into the microcomputer 603 at the electrical potential difference, and has told. 602 is a square wave generator, changes the duty ratio of a square wave and controls the switching element in the excitation circuit 601 by information from a microcomputer 603.
[0032] Although alternate magnetic flux sufficient as an exiting coil 201 for heating is generated, for that purpose, it is low in a resistance component, and it necessary to take a high inductance component. As a core wire of an exiting coil 201, using the thing for RFs of 3mm of wire sizes, in this example, it has wound 10 times so that Nip N may be around gone in a fixing film.
[0033] An exiting coil 201 generates alternate magnetic flux according to the alternation current supplied from the excitation circuit 601, and alternate magnetic flux makes the exoergic layer 101 of the fixing film 1 generate an eddy current. This eddy current generates the Joule's heat with the specific resistance of the exoergic layer 101, and can heat the toner T on the record material P conveyed by Nip N through the elastic layer 102 and the mold release layer 103, and the record material P.
[0034] The fixing film 1 is explained in detail using drawing 3 . The fixing film 1 has prepared two-layer [of the elastic layer 102 and the mold release layer 103 of a fluororesin which consist of silicone rubber] as a resin layer in the front face of the cylindrical exoergic layer 101 with a thickness of 50 micrometers it is thin from the nickel which is a resistor. Although it can heat by the same principle if it is the metal and metallic compounds which are the electric good conductors of 10-3 - 10-8 ohm-cm as a resistor, the film manufacture by electroforming is easy and the point that corrosion resistance is excellent to a nickel film is desirable. Usually, by adding additives, such as saccharin, benzenesulfonic acid sodium, and naphthalene sulfonic-acid sodium, into an electrolytic bath, the nickel film by electroforming reduced stress in electrodeposits, raised molding precision, and has given gloss to the electrocasting coat. Including sulfur, since nickel electrocasting manufactured by doing in this way on the other hand had a property of resiliency ******** at the time of flexibility or an elevated temperature, the problem that the metal fatigue occurred and fractured in the configuration of this invention generated it. Then, in the nickel film in this invention, what thought flexibility as important, decreased the quantity of the above-mentioned additive as much as possible, and made content of the sulfur in a nickel film below 0.04% (mass ratio) is used. If sulphuric content exceeds 0.04%, in an elevated-temperature condition, a nickel film will become weak or flexibility will be lost.
[0035] Moreover, it can prevent a nickel film becoming weak at high temperature by adding manganese to a nickel film. The approach of carrying out electroplating, where it was easy to put in a manganese particle and it is agitated as an approach of adding manganese into a nickel film, in the nickel electrolytic solution with which 300 - 450 g/l consists [nickel amiosulfonate], and 0 - 30 g/l and a boric acid consist [a nickel chloride] of 30 - 45 g/l is mentioned.
[0036] Moreover, when it is made thin, it becomes impossible to secure sufficient magnetic path about the thickness of the exoergic layer 101, and magnetic flux leaks to the exterior, and when it thickens, it has [own exoergic energy of a heating element may become small, and] the inclination for heat capacity to become large and for the time amount which a temperature up takes to become weak to about [becoming long] and crookedness fatigue. Therefore, with the value of the specific heat of the ingredient which used thickness for the

heating element, a consistency, permeability, resistivity, and impurity content, there is a proper value and that with which it is 50 micrometers in thickness in this example, and the programming rate 3 degrees C / more than sec can be obtained, and endurance is also satisfied of a programming rate was obtained.

[0037] The elastic layer 102 uses 200-micrometer silicone rubber, compensated with stability the exoergic layer 101 which consists of a nickel film, and has prevented fatigue by rotation and crookedness while it covers a heated image in the nip section and ensures transfer of heat.

[0038] As a mold release layer 103, the good ingredient of the mold-release characteristic of silicone resin, silicone rubber, a fluororubber, silicone rubber, etc. and thermal resistance can be chosen in addition to fluororesins, such as PFA, PTFE, and FEP. The problem that the bad part of a mold-release characteristic will be made in the ** nonuniformity of a paint film if the thickness of the mold release layer 103 has desirable 20-100 micrometers and the thickness of the mold release layer 103 is smaller than 20 micrometers, or endurance runs short occurs. Moreover, if a mold release layer exceeds 100 micrometers, the problem that heat conduction gets worse will occur, especially when it is the mold release layer of a resin system, a degree of hardness will become high too much, and the effectiveness of the elastic layer 102 will be lost.

[0039] Moreover, as shown in drawing 4 , a thermal break 104 may be formed in the lamination of the fixing film 1. As a thermal break 104, heat-resistant resin, such as a fluororesin, polyimide resin, polyamide resin, polyamidoimide resin, PEEK resin, PES resin, PPS resin, PFA resin, PTFE resin, and an FEP resin, is good. Moreover, as thickness of a thermal break 104, 10-1000 micrometers is desirable. When the thickness of a thermal break 104 is smaller than 10 micrometers, adiabatic efficiency is not acquired, and endurance also runs short. When it exceeds 1000 micrometers, the distance of the high permeability core 202 to the exoergic layer 101 becomes large, and magnetic flux stops on the other hand, fully reaching the exoergic layer 101. Since the temperature up of the exiting coil 201 by the heat generated in the exoergic layer 101 can be prevented when a thermal break 104 is formed, stable heating can be carried out.

[0040] It can choose with the occupancy volume of the exiting coil 201 and core 202 which are connoted as a path of the fixing film 1. Although the thing with a diameter of 40mm is used by the shape of a cylindrical shape by this example, supposing it constitutes this from a rigid-body roller, as shown in drawing 5 R> 5 (1), the radius of curvature in a nip down-stream edge is set to 20mm equally to the radius of a roller, curvature separation with a rotation heating object and record material becomes difficult, and auxiliary members, such as a separation pawl, are needed. In order to carry out rubbing of the rotation heating body surface, a separation pawl tends to cause the problem of the remains of wear, dirt, etc., and poses an important problem in high-definition image formation equipment conventionally. On the other hand, by this example, by using a strange film-like rotation heating object with good curvature, even when curvature is made high in a nip down-stream edge and the rotation heating object of a major diameter is used, it has attained performing curvature separation.

[0041] In addition, observation radius of curvature is the value which applied the thickness of the fixing film 1 to the rounding-off radius of the nip down-stream edge of the fixing film guide 105 when it was able to be considered that ** fixing film 1 has stuck to the film guide 105.

** The circumradius r when making the virtual circle C from the curve to which a fixing film connects a nip down-stream edge and the maximum clearance, when the fixing film 1 has a clearance to the film guide 105, as shown in drawing 5 (2). The definition is come out and given.

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EXAMPLE

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[0044] The experiment carried out the suspension of the fixing belt 1 to two rollers A and B as shown in drawing 6 , put in the halogen heater H in Roller B, and was made into the same temperature conditions as the time of image heating, the content of the sulfur included in the nickel film layer which is an exoergic layer of a fixing belt, and the radius r of Roller B were changed, and empty rotation durability and a record material separation trial were performed. A result is shown in Table 1.
[0045]
[Table 1]

表 1

	曲率半径 (mm) / 硫黄含有率 (%)	1	5	10	12	13
耐久時間(h)	0.02	> 1500	> 1500	> 1500	> 1500	> 1500
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	0.05	685	723	996	1052	> 1500
	0.1	610	623	645	710	1150
分離不良率		0/1000	0/1000	0/1000	0/1000	23/1000

[0046] By setting the radius of curvature in the separation section to 12mm or less, and making sulfur content in a nickel film into less than [0.04wt%] from a result, shows that the separability of record material can be secured and the film fracture by durable fatigue can be prevented. In addition, although the above-mentioned experiment followed a nickel film independent, when the difference arising from the existence of the resin layer covered on the above-mentioned nickel film in another experiment was checked, and a resin layer was prepared like this example, it turned out that the endurance life of a film is prolonged about 30% in the case where the radius of Roller B is 1mm.
[0047] moreover, the inside of a nickel film -- manganese -- minute amount ****** -- it can prevent nickel becoming weak by things at the time of an elevated temperature. The fixing film of this example needs to bear the temperature of about 200 degrees C, and the nickel film containing more than 0.2wt% manganese is used.
[0048] Next, it describes with actuation of image formation equipment about the operation effectiveness at the time of using the above-mentioned image heating apparatus as an anchorage device of 4 color color picture formation equipment whose maximum main street paper width is A4 size paper and whose printing speed is per minute three sheets.
[0049] Drawing 7 is the sectional view of the electrophotography color printer which used this invention. Electrification equipment for the photo conductor drum which was able to do 11 with the organic photo conductor, and 12 to perform uniform electrification to this photo conductor drum 11, and 13 are ON of a laser beam / laser optical box which changes off and forms an electrostatic latent image in the photo conductor drum

11 about the signal from a non-illustrated picture signal generator. 1101 is a laser beam and 1102 is a mirror. A development counter 14 develops the electrostatic latent image of the photo conductor drum 11 by making a toner adhere alternatively. A development counter 14 consists of Yellow Y, Magenta M, a color development counter of Cyanogen C, and a development counter B for black, develops the latent image on the Isshiki [every] photo conductor drum 11, and obtains a color picture for this toner image in piles one by one on the middle imprint object drum 16. The middle imprint object drum 16 has the elastic layer of the inside resistance to metal drum lifting, and the surface of high resistance, gives bias potential to a metal drum, and imprints a toner image by the potential difference with the photo conductor drum 11. On the other hand, the record material P sent out with the feed roller from the sheet paper cassette is sent in between the imprint roller 15 and the middle imprint object drum 16 so that it may synchronize with the electrostatic latent image of the photo conductor drum 11. The imprint roller 15 is supplying a toner and the charge of reversed polarity from the tooth back of the record material P, and imprints the toner image on the middle imprint object drum 16 on the record material P. In this way, the record material P which carried the non-established toner image can apply heat and ** with the heating anchorage device 10, is made they to carry out permanent fixing on the record material P, and is discharged to a paper output tray (un-illustrating). The toner and paper powder which the toner and paper powder which remained on the photo conductor drum 11 were removed by the cleaner 17, and remained on the middle imprint object drum 16 are removed by the cleaner 18, and the photo conductor drum 11 repeats the process after electrification.

[0050] Above-mentioned image heating apparatus is used for the anchorage device 10, it is heated by nip, is fixed to a toner image, and the record material P is separated at a nip outlet.

[0051] As mentioned above, also when the thermal resistance is small, consumes the heat of a heating element to true image heating and is established in a full color image with many amounts of toners in the above-mentioned configuration as compared with the anchorage device of a heat mechanical control by roller which connotes a halogen heater through the resin layer of the elastic layer 102 or the mold release layer 103, the image heating apparatus of this example can fuse a toner image enough, and can obtain high-definition image formation equipment. Moreover, since the heat capacity of an anchorage device is small, fixing on demand can be possible, and waiting power consumption can be reduced remarkably.

[0052] Moreover, although this example has explained 4 color color picture formation equipment, you may use for monochrome or one-pass multicolor image formation equipment. In this case, the elastic layer 102 can be omitted as a resin layer of the fixing film 1, and it can be made only the mold release layer 103.

[0053] [Example 2] Next, other examples of this invention are explained.

[0054] This example is what attained miniaturization much more than image heating apparatus, and an outline configuration is shown in drawing 8 . In addition, a same sign shall be given to the member of drawing Nakamae appearance and this function.

[0055] The phi40mm thing is used like the above-mentioned as a fixing film 1, and suspension has been carried out with the film guide 105, the driving roller 19, and the tension roller 20. Both 19 or 20-car rollers use the thing with a diameter of 15mm, and with the driving roller 19, nonskid processing was performed to the front face, the rotation drive was contacted and carried out by the inside of the fixing film 1, and high friction, and carrying out follower rotation, the tension roller 20 with a smooth front face has applied the fixed tension to the fixing film 1, and has secured the good contact to a driving roller 19. At the nip outlet of this configuration, the curvature of the fixing film 1 can be made high (observation radius of curvature of 0.5mm or less) with the tensile force by the tension roller 20.

[0056] Since the fixing film 1 is driven with the pressurization roller 3 in the first above-mentioned example, when record material is inserted in nip, since the direct fixing film 1 can be driven, by this example, there is an advantage of being hard to generate the problem of a slip etc., to driving force declining.

[0057] On the other hand, these configurations are the three suspension sections, in addition to changing the curvature of the fixing film 1 a lot, need to add a tension to the fixing film 1, and tend to give crookedness or hauling stress. About this point, by having stopped the sulfur content to 0.04% or less, and having given flexibility, the fixing film 1 of this invention prevents fracture by the metal fatigue of the fixing film 1, and can realize the image heating apparatus of high durability.

[0058] [an example 3] -- a degree -- this invention -- being the further -- others -- an example is explained. This example has electric-conduction-ized the elastic layer 102 in the first example. The thing with a thickness of 300 micrometers which carried out optimum dose combination of the carbon black, and was specifically

adjusted to silicone rubber by the volume resistivity below at 106-ohmcm is used. About electric-conduction-izing of the elastic layer 102, a metal whisker etc. may be blended in addition to the above-mentioned approach. On the other hand, the volume resistivity of the mold release layer 103 functions as an insulating layer above 1014-ohmcm.

[0059] The role of this conductive elastic layer in this example is to generate heat oneself and contribute to image heating while it consumes the energy of the magnetic flux which leaks to the perimeter of the exoergic layer 101 which consists of a magnetic metal according to the current which flows the inside of an electric conduction elastic layer and intercepts the magnetic flux to the circumference. Since the leakage flux to the circumference will increase if thickness of the exoergic layer 102 is made thin in order to prevent the metal fatigue especially, the role of a conductive elastic layer becomes important.

[0060] Although the resistance of the above-mentioned conductive elastic layer generally has the inclination for exoergic effectiveness to become low when it uses as an exoergic layer independently since permeability is also greatly small again as compared with a magnetic metal as compared with a magnetic metal, according to the configuration of this invention, the great portion of magnetic-flux energy is consumed with a magnetic metal, and efficient heating can be realized to a case, using the above-mentioned conductive elastic layer as that with which this is compensated.

[0061] Moreover, the magnetic metal in this example works as an induction member of magnetic flux to the above-mentioned conductive elastic layer, and has the operation which makes high the consistency of the line of magnetic force led to a conductive elastic layer, and raises exoergic effectiveness.

[0062] Its attention is paid to this invention generating heat efficient in the form supplementary to the demerit in which the main exoergic layer which consists of a magnetic metal mentioned above and the electric-conduction-ized resin layer are mutual.

[0063] The mold release layer 103 weakens the reflection force which commits also as an insulating layer which insulates record material to the conductive elastic layer 102, and is committed in the heated image and the conductive elastic layer on record material, and has the effectiveness which prevents generating offset dirt.

[0064] Drawing 9 shows the experimental result which checked the effectiveness at the time of using conductive rubber as a resin layer, is the conditions of input power 1000W and rotational-speed 120 mm/sec, and plots the situation of the fixing film temperature rise from a room temperature. As for the combination with a magnetic metal, it turns out that exoergic effectiveness becomes [the direction which used the electrical-conductive-gum layer] high from an insulating rubber layer more nearly again than a conductive rubber independent.

[0065] [an example 4] -- a degree -- this invention -- being the further -- others -- an example is explained. This example is making the elastic layer 102 distribute the magnetic substance further in the configuration of said third example. It is suitable to use metals, such as nickel, cobalt, and iron, or these magnetic compounds as the magnetic substance, and the elastic layer 102 has high permeability with the magnetic substance as if carbon black shows conductivity. Since the line of magnetic force of a high consistency passes in a conductive elastic layer by this, the flowing induced current consistency can make a conductive elastic layer high, and improvement in the further exoergic effectiveness can be obtained.

[0066] When it heated by being that which blended the magnetic substance with the elastic body 102, and increased permeability 10 to 200 times according to examination, this calorific value (1000W) was able to be obtained in the electrical potential difference low 10% or more. It means that this consumed efficiently the magnetic flux which the exiting coil 201 generated with the fixing film 1, and has changed it into heat, and it is not only energy saving, but according to this invention, it is possible to reduce a power-source load and it can realize low cost image heating apparatus or the image formation equipment using this.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is an outline sectional view explaining the 1st example of this invention.
[Drawing 2] It is the outline perspective view and circuit connection diagram which the 1st example of this invention explains.
[Drawing 3] some fixing films of the 1st example of this invention -- it is a sectional view.
[Drawing 4] It is drawing explaining actuation of the 1st example of this invention.
[Drawing 5] It is an outline sectional view explaining the performance test of the fixing film of this invention.
[Drawing 6] It is an outline sectional view explaining the color picture formation equipment using the image heating apparatus of this invention.
[Drawing 7] It is drawing explaining the principle of the 1st example of this invention.
[Drawing 8] It is an outline sectional view explaining the 2nd example of this invention.
[Drawing 9] It is drawing explaining the effectiveness of the 3rd example of this invention.
[Drawing 10] It is drawing showing the example of use of the conventional example.
[Description of Notations]
1 Fixing Film
101 Magnetic Metal Layer
102 Elastic Resin Layer
103 Covering Resin Layer
201 Exiting Coil
202 Core
3 Pressurization Roller

[Translation done.]

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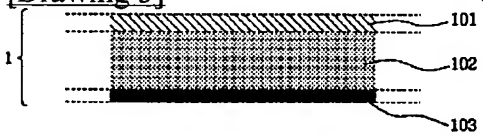
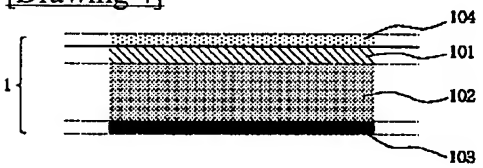
DRAWINGS

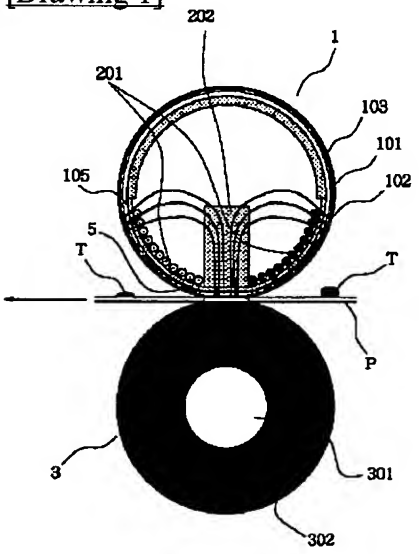
[Drawing 3]



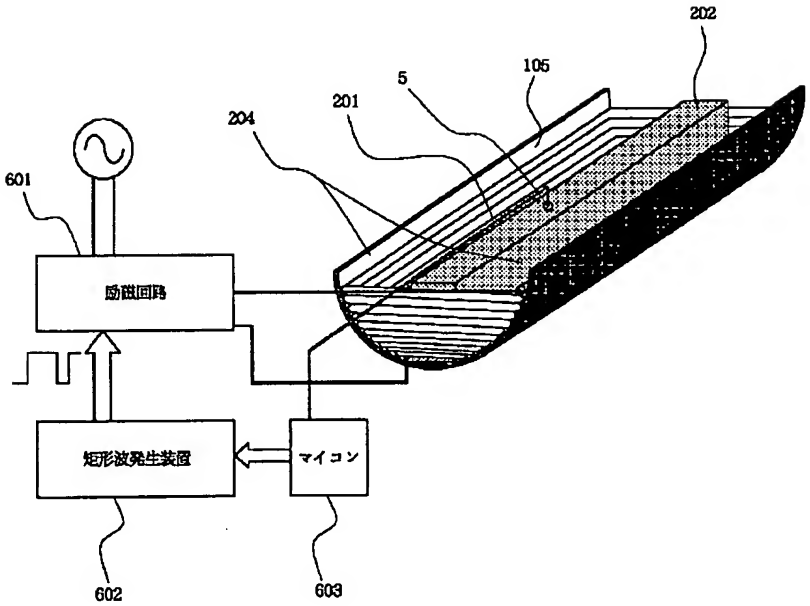
[Drawing 4]



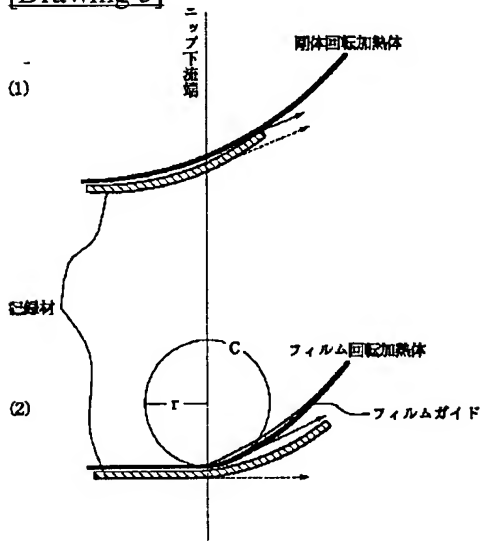
[Drawing 1]



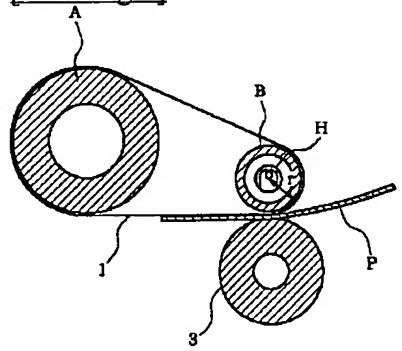
[Drawing 2]



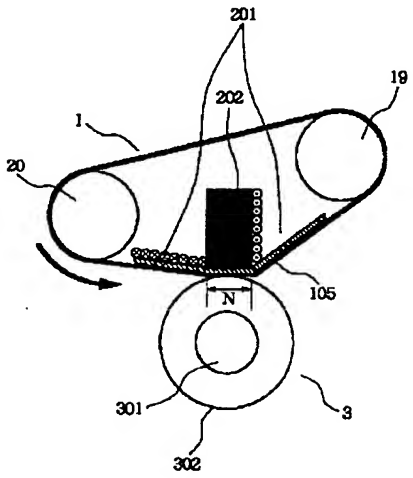
[Drawing 5]



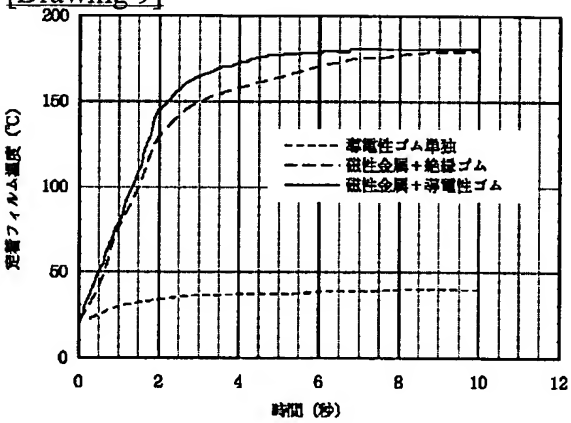
[Drawing 6]



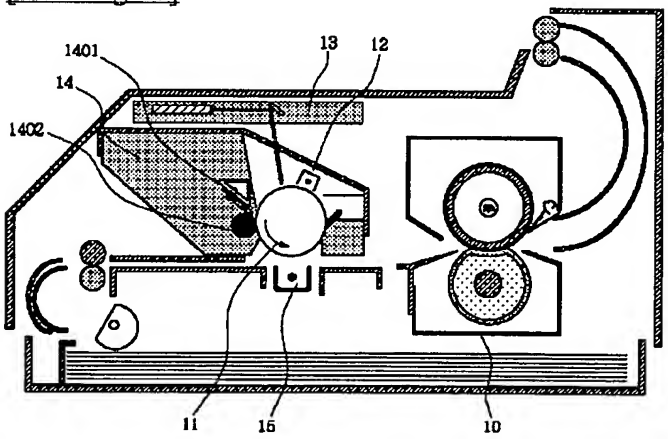
[Drawing 8]



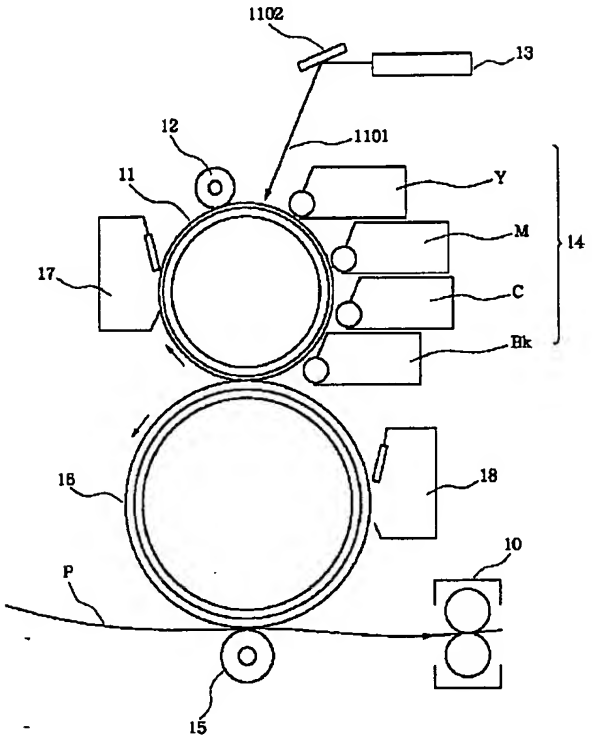
[Drawing 9]



[Drawing 10]



[Drawing 7]



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